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(19) (CA) CANADIAN PATENT (12)

(54) Production Method Relating to a Lining Part Integrally  
with its Fire-Proof Barrier and Amenity Items Equipped  
with Lining Parts thus Obtained

(72) Dubus, Michel-Raymond , France

(73) Hutchinson , France

(30) (FR) France 87 12494 1987/09/09  
(FR) France 87 12678 1987/09/14

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ABSTRACT OF THE DISCLOSURE

This invention relates to a method for producing a lining part (16) integrally with a fire-proof barrier which envelops it, the said lining part being made of inflammable polymeric foam and is obtained by moulding.

The method as claimed in the invention is characterized in that it comprises the following stages :

- i) embodiment of two thin ductile and impervious sheets by coating the internal side with a shirred fabric highly-resistant to fire by means of an elastic polymeric compound (15), especially an elastomer, which comprises a filler designed to make it flame-resistant and which is compatible with the material from which the lining part is made of,
- ii) coating of the walls of the mould (1) used for moulding the lining part (16) by means of thin ductile impervious sheets (11, 12) thus coated,
- iii) plating of these impervious coating sheets against the corresponding walls of the mould by means of suction,
- iv) injection of the polymeric material (17) comprising the lining inside the mould.

To be applied to the embodiment of industrial transport amenity articles, especially in the aircraft industry.

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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of producing a lining member of a foaming polymer material provided with a sealing-tight casing and intended for any comfort article such as a seat, armrest, headrest, bench seat or shock absorber, comprising the following operations:

covering the inside walls of a mould by means of the casing;

the use of vacuum to apply the casing lining to the walls of the mould flush against the said walls;

direct injection of the foaming polymer material used for providing the lining, on the inside of the casing which is thus applied flush against the walls of the mould, the said method being characterised in that it likewise comprises the following stages:

- prior provision of the sealing-tight casing forming a fire check barrier and constituted by thin and deformable composite sheets by induction of the inside surface of an elastic cloth, offering a high degree of flame-resistance, by means of a composition of a particularly elastomeric elastic polymer material, comprising a filling intended to render it fireproof and compatible with the foaming polymer material;

- extraction of the moulded lining member which is provided with its fire check barrier constituted by the aforesaid composite sheets and the performance of finishing operations such as the cutting of the portions of the said composite sheets which extend beyond the overall limits of the said

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member and welding of these sheets according to the cutting contours.

2. A method according to claim 1, characterised in that the said elastic cloth is constituted by polyaramide fibres and pre-oxidised fibres which are woven together, especially by a knitting process, so that they impart multi-directional elasticity to the woven fabric.

3. A method according to claim 1 or 2, characterised in that the fireproof lining member which is thus obtained comprises a decorative covering.

4. A method according to claim 3, characterised in that the said decorative covering is constituted by the flexible fabric which itself offers a high degree of flame-resistance.

5. A method according to claim 1, 2 or 4, characterised in that the elastic cloth is, on its face which is in contact with the lining, coated with a dissolution of a fire-proofed silicone-elastomer mixture.

6. A method according to claim 5, characterised in that the elastic cloth is a jersey-type glass cloth.

7. Comfort article, such as a seat, armrest, headrest, bench seat, or shock absorber, wherein these are equipped with at least one fireproof lining member and embodied with its fire check barrier by the method as claimed in claim 1 or 2.

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8. Comfort article as claimed in claim 7, wherein the said elastic cloth is made from polyaramide fibres and pre-oxidized fibres, or glass fibres which are woven together, especially by a knitting process, so that they impart multi-directional elasticity to the woven fabric.

9. Comfort article as claimed in claim 7, wherein the fireproof lining member which is thus obtained comprises a decorative covering.

10. Comfort article as claimed in claim 8, wherein the fireproof lining member which is thus obtained comprises a decorative covering.

11. Comfort article as claimed in claim 9 or 10, wherein the said decorative covering is constituted by the flexible fabric which itself offers a high degree of flame-resistance.

12. Comfort article as claimed in claim 7, wherein the elastic cloth is, on its face which is in contact with the lining, coated with a dissolution of a fireproofed silicone-elastomer mixture.

13. Comfort article as claimed in claim 8, wherein the elastic cloth is, on its face which is in contact with the lining, coated with a dissolution of a fireproofed silicone-elastomer mixture.



## FIELD OF THE INVENTION

The present invention relates to a method for producing fire-proof lining parts and designed for amenity items, such as seats for public transport vehicles and more particularly for planes, armrests, head rests, seating units, damping terminals or analogous devices and items equipped with the lining parts thus obtained.

## BACKGROUND OF THE INVENTION

It is already known how to provide the frame of vehicle seats with a shock absorber lining part whose shape is adapted to that of the seat and which is made of foams comprising a grille cloth external coating.

Moreover, it is now customary for this purpose to use polyurethane foams which, from amongst the shock absorber polymers currently used in industry, are probably the most suitable materials as regards their mechanical properties and the cost price.

However, given the fact that unfortunately polyurethane foams are very sensitive to temperature (because their urethane groups easily suffer pyrolysis and their aliphatic bonds are thermally oxidizable, the decomposition of these foams already occurs at about 250°C), it is common practice to protect against fire by providing a polyurethane lining part by means of a fireproof barrier constituted by a flame-retardant, and thus fireproof, lining or cover, inserted between the lining part and the grille



cloth.

Up until now, two types of the following linkages are known to be used between the fireproof layer and the grille cloth :

- 5 1. - loose or flaccid linkage, without any mutual adherence, which firstly requires an additional construction for the seat coverer who needs to separately secure the fire-proof lining or cover to the lining  
10 part and frame and then to fix the covering and, secondly, the relative displacement or movement between the lining and the coating with the formation of unaesthetic folds ;  
15 in addition, the presence of seams in the fireproof lining is another negative aspect of this solution. ;
2. - Intimate bonding by means of bonding agents (glues), which, apart from reducing the flexibility of the entire unit, exhibit  
20 fire-resistance properties which are unsatisfactory and which seriously compromise the protective function of the fire-proof lining.

25 However, even if solution 2 is preferable to the first in that it eliminates the aforesaid drawbacks due to loose bonding of the lining with regard to the grille cloth, the second solution presents drawbacks identical to those of the first solution as regards the lining.

30 The present invention is therefore seeking to provide a method enabling an intimate bonding to be obtained between the fire-proof lining and the lining part, so that the latter and its fire-proof protection are like a monolithic structure,

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obtained without any glue or seam.

#### SUMMARY OF THE INVENTION

5           The aim of the present invention is to provide a production method relating to a lining part integrally with a fire-proof barrier surrounding it, the said lining part being made of an inflammable polymer foam and is obtained by moulding and is  
10           intended for any amenity item, such as a seat, armrest, headrest, seating unit, shock absorber terminal or an analogous device, the said method being characterized in that it comprises the following stages :

- 15           i) embodiment of thin ductile impervious sheets by coating the internal side with a shirred fabric exhibiting a high degree of resistance to flames means of an elastic polymer material, especially elastomer, which includes  
20           a filler designed to render it fire-retardant and is compatible with the material constituted by the lining part,  
            ii) covering of the walls of the mould used for moulding the lining part by means of the  
25           ductile impervious sheets thus coated,  
            iii) cladding these impervious coating sheets against the corresponding walls of the mould, by means of suction,  
            iv) injection of the polymer material constituted  
30           by the lining part inside the mould.

            As regards the garnishing material used within the scope of the present invention, this preferably consists of polyurethane foam whose expansion occurs inside the mould following the



aforesaid injection operation at iv).

5 The fact that the fire-proof barrier (namely, the aforesaid shirred fabric) is integrally embodied with the lining part offers the advantage of eliminating wear and tear of the barrier, this being due to the relative displacement occurring in embodiments of the previous Art, and which does not occur with the articles embodied as claimed in the invention  
10 because the intimate bonding between the fire-proof barrier and the polyurethane foam results in the coated fire-proof fabric undergoing the same deformations as those of the lining part.

15 According to one mode of embodiment favorable to the invention, the said shirred fabric consists of polyaramid fibers and preoxidized fibers which are woven together, specially by knitting, so that they provide the fabric with a multidirectional elasticity.

20 According to another mode of embodiment favorable to the method as claimed in the invention, the fire-protected lining part thus obtained comprises a grille cloth which is preferably made of the said multidirectional elastic protective fabric.  
25

Apart from the preceding dispositions, the invention still includes other dispositions, which will be specified in the following description.  
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#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more readily understood by referring to the following

additional description, which relates to the annexed drawings in which :

figure 1 is a diagrammatic view illustrating the working principle of the mould used for implementing the method as claimed in the invention ;

figures 2, 3 and 4 are also diagrammatic views of the various stages of this method ; and

figure 5 is again another diagrammatic view of an amenity article (cushion) obtained by means of the method as claimed in the invention.

However, it should be properly understood that these drawings and the corresponding descriptive parts are given solely as an example illustrating the aim of the invention and consequently in no way limit the possibilities of this invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The working principle of a mould likely to be used within the context of the present invention can be more readily understood by referring to figure 1 where a mould 1 is shown in two parts defined by the numerical references 2 and 3. In each part of the mould, a large number of suction pipes are provided, uniformly distributed such as 4'a to 4'g and 4"a 4"g, connected to a main pipe 5 and 6 respectively, which are connected to a suction pump 7 and 8 respectively.

Each of these pumps 7 and 8 is intended to clad, against the internal side of the corresponding mould portion 2 and 3, a sheet 11

and 12 (visible on figure 2) by means of the suction produced by the aforesaid pumps (cf. also figure 3).

5 The sheets 11 and 12 are thin compound impervious ductile sheets, each of which is obtained from a thin fire-proof shirred fabric 13 and 14, respectively, which is coated on one side - namely the internal side intended to come into intimate contact with the lining part, by  
10 becoming integral with the latter - by means of an elastic polymer compound, preferably an elastomer, which is firstly rendered fireproof by incorporating a suitable filler (recognised by technicians) and which is stretched over each thin  
15 sheet of fabric 13 and 14, in the form also of a thin layer 15.

Once this preliminary stage for preparing the thin ductile impervious sheets 11 and 12 is ended, this involves :

- 20 - positioning them in each of the portions 2 and 3 of the mould 1, as shown on figure 2,  
- cladding them against the internal face 9 and 10 of the corresponding mould portion 2 and 3,  
25 respectively, by activating the suction pumps 7 and 8 (cf. figure 3),  
- closing the mould 1 by superimposing the portion 2 onto the portion 3 of the mould whilst maintaining the suction produced by the  
30 pumps so that the composite sheets 11 and 12 are always intimately cladded against the aforesaid internal faces 9 and 10 (cf. figure 4),  
- injecting a suitable polymer material inside

the previously prepared mould 1 in order to receive this material with the aid of an injection device (shown diagrammatically on figure 1); the chosen lining polymer material may consist of polyurethane (PU) which is sucked in its liquid state from a vessel 17 by a pump 18 cooperating with a blending device 19 disposed downstream of the pump 18 immediately before the injection nozzle 20 (cf. also figure 4) : the blending device 19 has two inputs 21 and 22, the first being for the polyurethane and the second for additives, especially consisting of accelerators, intended to favor cross-linkage of the polyurethane derived from the vessel 17;

- extracting the moulded product - after expansion of the polyurethane (cf. the numerical reference on figure 4), which is naturally linked to the composite sheets 11 and 12 by virtue of the compatibility between the polyurethane and the flame-retarded elastomer coated on each thin shirred fabric sheet 13 and 14 - such as the cushion 23 shown diagrammatically on figure 5, in order to carry out the required finishing operations, such as the cutting of the portions of the composite sheets exceeding the spatial requirement limits of the moulded product and welding of this sheets along the circumference of the cut.

By means of the method as claimed in the invention, it is thus possible to obtain amenity items, such as seats, headrests, armrests, seating units, damping terminals or other items, the lining of these items being embodied integrally

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(intimately linked) with the fireproof barrier constituted by the aforesaid composite sheet whose supporting shirred fabric of the coated elastomer can preferably also play the role of an appearance cover, itself also thus being integrated with the lining.

Of course, it is possible to provide the product obtained by means of the method as claimed in the invention with a separate appearance cover without, however, departing from the context of the invention.

By way of example in no way restrictive, here are some of the materials which can be used to implement the method as claimed in the invention :

- as regards the ductile shirred fabric, it would be an advantage for this to be made of a "PANOTEX"\* jersey fabric comprised of "PANOX P 505"\* fibers and aramid,
- as regards the impervious linking coating intended to be coated on one face of the said ductile fabric, it would be an advantage for this to be a flame-retarding polyurethane based mixture (flame-retarding agents possibly including, amongst other elements, a halogen compound) ; the thickness of the impervious film is preferably between 1 and 8/100 mm, half of which is retrieved - after absorption - on the coated side of the fabric ;
- as regards the cellular polyurethane, this is a bi-constituent liquid, the polyalcohol of which is formularized in particular with an agent swelling at low temperatures and organo-metallic flame-retarding agents.

\* trademark

The working temperature is between 30 and 40°C (preferably, the mould is also slightly heated).

Finishing of the product obtained via the method described earlier concerns the cutting of burrs and especially the weld seam of the two coated fabrics 13 and 14 by means of melting the coating polyurethane.

In one variant, the fireproof barrier is embodied as claimed in the invention with the aid of a fabric having a high degree of resistance to fire with at least one of its faces being coated imperviously with a dissolution of a flame-retarded silicon/elastomer mixture. Preferably, this fabric consists of a glass fabric, especially of the "STEVENS-GENIN T 235"\*type whose weight is about 90 grams per square metre. The fabric thus coated and the polyurethane foam cushion conform to the standard ATS 1000.

Even if, such a coated fabric may also be glued onto a polyurethane foam lining by means of a glue consisting of a cold cross-linkable silicon diluted inside a solvent (of course, the viscosity needs to be adjusted in order to facilitate the coating which, preferably, is carried out on the two sides to be glued), the method according to the present invention gives better results as it allows to obtain the fire-proof barrier integrally with the lining.

The fabric is in the form of a linen cloth or, preferably, a jersey cloth.

Thus, the present invention makes it possible to embody extremely light fireproof barriers, whilst being highly fire-resistant in an exceptional fire.

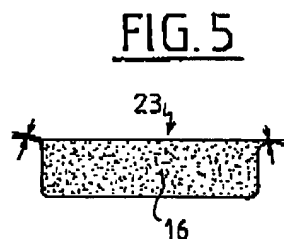
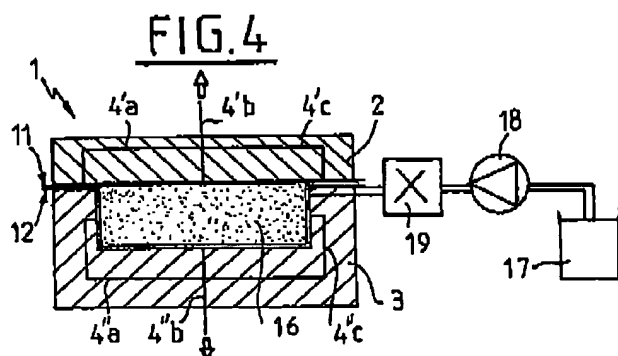
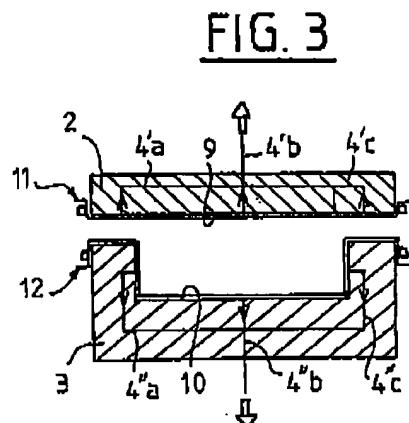
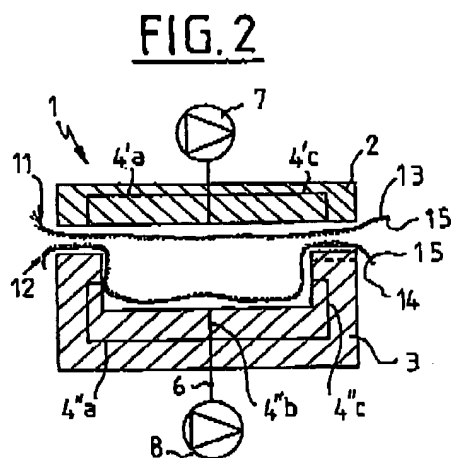
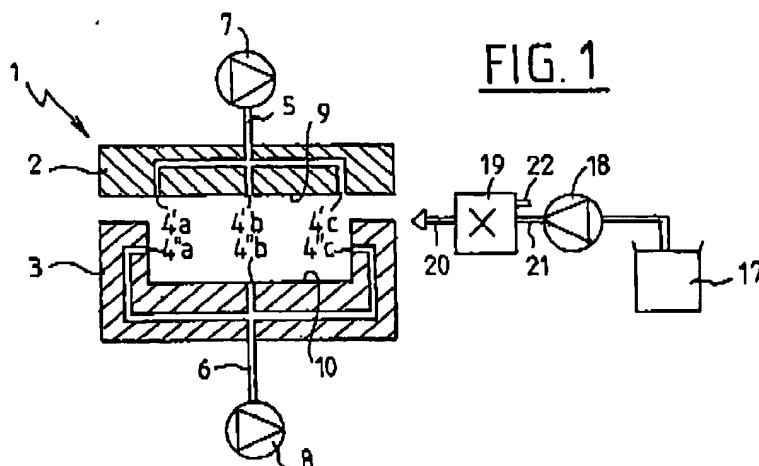
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It is also possible to use other fabrics having a high degree of resistance to fire and, in particular, a fabric with preoxidized fibers, especially the fabric known under the trade mark "FIROTEX".

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*Andreas Flage, Arthur & Martin Walker*



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